UNITED STATES PATENT AND TRADEMARK OFFICE

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EXAMINER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on <u>24 July 2007</u>.

2a) ☐ This action is **FINAL**.   2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) <u>1-33</u> is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) <u>1-33</u> is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☐ All   b) ☐ Some * c) ☐ None of:

      1. ☐ Certified copies of the priority documents have been received.

      2. ☐ Certified copies of the priority documents have been received in Application No. _____.

      3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

1.   The amendment filed on July 24, 2007 is entered and made of record.

2.   The terminal disclaimer filed on July 24, 2007 is noted and the double patenting

rejection made on previous office action, mailed on April 18, 2007, is withdrawn.

Response to Applicant's Arguments

1.   On page 10, the applicant stated:

Choi and Zhang '440 do not teach or suggest the invention recited in claim 1.

Claim 1 recites choosing the pixels for the cumulating step at least according to a

comparison of a first maximum luminance threshold to adjacent pixels in a concerned

direction. The examiner admits that Choi does not suggest such a choosing step.

Zhang '440 also does not teach or suggest choosing pixels for the cumulating

step at least according to a comparison of a first maximum luminance threshold to

adjacent pixels. Instead, Zhang '440 teaches that the gradient of a pixel will be

calculated if the gray scale value of that pixel falls within a certain range, i.e., between a

median pupil value Mp and a median iris value Mi (col. 3, lines 18-22). Comparing a

single gray scale value of the pixel being selected to the values Mp, Mi does not amount

to a comparison of plural adjacent pixels to a maximum luminance value as recited in

claim 1. At no point does Zhang '440 or Choi suggest choosing the pixels for the

cumulating step at least according to a comparison of a first maximum luminance

threshold to adjacent pixels in a concerned direction.

The examiner disagrees; the examiner will clarify. Choi discloses a method for

determining a score characteristic of a definition of a digital image, comprising

cumulating quadratic norms of horizontal and vertical gradient of luminance values of

pixels of the image to determine a cumulated total (see equation 15, F_x^2 and F_y^2 are

gradient results from horizontal and vertical directions, where the gradient calculation is

shown in equation 10; the summing of the gradients in the vertical or horizontal direction

is read as the cumulating step); and choosing pixels for the cumulating step (all the

pixels used to cumulate the gradients). Choi does not disclose choosing the pixels for

the cumulating step at least according to a comparison of a first maximum luminance

threshold to adjacent pixels in a concerned direction. Zhang (US pat no 5,953,440)

discloses choosing the pixels for gradient measure step at least according to a

comparison of a first maximum luminance threshold to adjacent pixels in a concerned

direction (see figure 1, element 20, the pixels that are between Mp and Mi are selected

to compute a gradient measure; each pixels in the left arc region or right arc region, see

figure 2 area length of $0.4r_i$, are adjacent to each other and each pixel in those region

are compared to both Mp and Mi thresholds to determine if the particular pixel is in

range between Mp and Mi; Mi is the maximum threshold; horizontal direction is read as

the concerned direction). One skilled in the art would include choosing pixel step

because these pixels are use to compute the sharpness of the image to determine

whether the current image need to be adjusted so that the blur in the image are

minimized.

2.   On page 11, the applicant stated:

The applicant disagrees with the Examiner's assertions on page 10 of the Office Action

regarding claim 3. In particular Zhang '440 does not select a current pupil pixel only if

two iris pixels to the left and right of the pupil pixel are less than Mi and Zhang '440
does not perform a median threshold calculation based on a kernel of 3 to 5 pixels.

The examiner agrees with the applicant. The limitation: 'selecting a current pixel having
a vertical or horizontal gradient to be taken into account in the cumulated total only if the
luminance of two pixels distant from the current pixel by a predetermined interval in the
concerned direction are smaller than said first maximum luminance threshold' reflects
on the teachings of the current invention specification, shown in page 12, lines 1 to 7.
To calculate the vertical gradient, two pixels on top of the current pixel and two pixels
below the current pixel are use; to calculate the horizontal gradient, two pixels on the
right and two pixels on the left are use. In the examiner's new search Aoyama (US pat
no 5,398,292) discloses a 5 X 21 mask to detect edge in an image (see figure 3); this
edge is an alternative to the gradient measure Sobel filter shown in figure 11. This mask
selects two pixels above the current pixel, given that the current is in the middle of the
mask, and selects two pixels below the current pixel during filtering operation
(convolution), this read on 'selecting a current pixel having a vertical or horizontal
gradient to be taken into account in the cumulated total only if the luminance of two
pixels distant from the current pixel by a predetermined interval in the concerned
direction.' The concerned direction is vertical direction.
One skilled in the art would include a larger mask to calculate an edge or a gradient
value because some edges are thicker than other edge, using a larger will compensate
for the thickness of the edge calculation, which improves texture and edge detection of
the image.

3.   Regarding the amended limitation to claim 16, 'comparing a gradient of the pixel

to a maximum gradient threshold,' the examiner found Cheng (US pub

no2004/0179752) discloses comparing a gradient of the pixel to a maximum gradient

threshold and choosing the pixel for cumulating step at least according to the comparing

of the gradient to the maximum gradient threshold (see paragraph 159, plurality of

gradients are compared to a gradient threshold, if the gradients are less than this

gradient threshold selected blue and green component pixels are selected). One skilled

in the art would include step of comparing gradients to a maximum threshold because

this threshold is use to determine the white areas of the eye, where the pixels there are

all smooth with no edges, once the white areas is located then one will be able to locate

the pupil and iris region.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

2.   Claims 1 – 7, 11, 15 and 31 – 33 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Choi (IEEE titled: New Autofocusing Technique using Frequency

Selective Weighted Median Filter for Video Cameras) in view of Zhang (US pat no

5,953,440).

With regards to claim 1, Choi discloses a method for determining a score characteristic

of a definition of a digital image, comprising cumulating quadratic norms of horizontal

and vertical gradient of luminance values of pixels of the image to determine a

cumulated total (see equation 15, F_x^2 and F_y^2 are gradient results from horizontal and

vertical directions, where the gradient calculation is shown in equation 10; the summing

of the gradients in the vertical or horizontal direction is read as the cumulating step);

and choosing pixels for the cumulating step (all the pixels used to cumulate the

gradients). Choi does not disclose choosing the pixels for the cumulating step at least

according to a comparison of a first maximum luminance threshold to adjacent pixels in

a concerned direction. Zhang discloses choosing the pixels for gradient measure step at

least according to a comparison of a first maximum luminance threshold to adjacent

pixels in a concerned direction (see figure 1, element 20, the pixels that are between Mp

and Mi are selected to compute a gradient measure; each pixels in the left arc region or

right arc region, see figure 2 area length of $0.4r_i$, are adjacent to each other and each

pixel in those region are compared to both Mp and Mi thresholds to determine if the

particular pixel is in range between Mp and Mi; Mi is the maximum threshold; horizontal

direction is read as the concerned direction). One skilled in the art would include

choosing pixel step because these pixels are use to compute the sharpness of the

image to determine whether the current image need to be adjusted so that the blur in
the image are minimized.

With regards to claim 2, Choi discloses all of the claim elements / features as discussed
above in rejection for claim 1 and incorporated herein by reference, but fails to disclose
dividing the cumulated total by the number of cumulated quadratic norms. It is well
known in the art to obtain a percentage measure of similarity by comparing biometric
images to template images from a database (see MPEP 2144.03). One skill in the art
would include a dividing step because to ease setting a threshold similarity value to
identify an individual ranging from 0% to 100%.

With regards to claim 3, an extension to the arguments in claim 1, Zhang discloses
choosing step includes selecting a current pixel having a vertical or horizontal gradient
to be taken into account in the cumulated total only if the luminance of two pixels distant
from the current pixel by a predetermined interval in the concerned direction are smaller
than said first maximum luminance threshold (see fig 1 – 12 – 20 – the selected pixel is
within the pupil and the two other pixels are on the left and right side of the iris, fig 2, the
selected pixels are less than Mi, also see col. 3 lines 18 – 22 – the median threshold
calculation takes a kernel of three to five pixels, the middle pixel is read as the current
pixel and the two other pixels are located at end of the kernel).

With regards to claim 4, an extension to the arguments in claim 1, Zhang discloses first

maximum luminance threshold is chosen according to an expected luminosity of

possible specular spots, which are desired not to be taken into account (see col. 1 lines

64 – 67).

With regards to claim 5, see the rationale and rejection for claim 4. In addition, see col.

3 lines 18 – 28 of Zhang, where the selections of pixels are to avoid selecting those that

are effect by specular reflection; the length of the interval can range from 1 to 2 pixels

depending on the size of the specular reflection.

With regards to claim 6, in an extension to the arguments to claim 1, Zhang discloses a

gradient is taken into account in the cumulated total only if its value is smaller than a

predetermined gradient threshold (see fig 1 – 24 – the gradient threshold is selected to

be the largest gradient value).

With regards to claim 7, in an extension to the arguments to claim 1, Zhang discloses

the gradient threshold is chosen according to image contrast (the contrast of the image

depends on the gray scale value pixels, which determines the threshold, fig 1 – 14 and

16).

With regards to claim 11, in an extension to the arguments to claim 1, Zhang discloses

the image is an eye image (see fig 2).

With regards to claim 15, see the rationale and rejection for claim 1.

With regards to claims 31 – 33, see the rationale and rejection for claim 1.

3.   Claims 8 – 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Choi in view of Zhang ('440) as applied to claim 1 further in view of Schwartz (US pub

no 2002/0181746).

With regards to claim 8, Choi discloses all of the claim elements / features as discussed

above in rejection for claim 1 and incorporated herein by reference, but does not

disclose a selecting pixels which is smaller than a second threshold. Choi's second

threshold is computed by taking the median of all the pupil pixels, Mp, but the pixels that

are selected for gradient calculations are not smaller than Mp. Schwartz suggests using

plurality of thresholds to separate the very dark pixels, which is most likely the pupil,

intermediate light pixels, which represents the background, and the very bright pixels,

which most likely represent the iris of the eye or a specular spot reflection (see

paragraph 105 to 109). One skill in the art would include a step of selecting pixels which

is smaller than a second threshold because to distinguish the different regions of the

eye image to determine correct pixels to use for gradient measure and to avoid specular

spots reflection pixels to avoid identification errors.

With regards to claim 9, an extension to the arguments of rejection for claim 8, Zhang

also discloses a second threshold selected to be greater than an expected light intensity

o a characteristic element contained in the digital image (see fig 1, element 20, Mp).

With regards to claim 10, an extension to the arguments of rejection for claim 8, Zhang

discloses element is an iris of an eye (see figure 2).

4.   Claims 12 – 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Choi in view of Zhang ('440) as applied to claim 1 further in view of Zhang (US pat no

5,978,494).

With regards to claim 12, Choi discloses all of the claim elements / features as

discussed above in rejection for claim 1 and incorporated herein by reference, but fails

to disclose choosing steps to one or several images of a set of digital images

representing a same object. Zhang '494 discloses choosing steps to one or several

images of a set of digital images representing a same object (see fig 1 – 18, 24 or 33).

One skill in the art would include a step of choosing a best biometric image from a set of

biometric image of the same object because to enroll biometric information from the

person into an individual identification system, which is use to validate an individual who

is trying to gain access into a secure area, protecting the secure area.

With regards to claim 13, an extension to the arguments of claims 1 and 12, the

combination of Choi, Zhang '440 and Zhang '494 disclose performing an approximate

definition test on the images of the set based on cumulating of gradients in a single

direction of the light intensities of the image pixels and performing the steps of

cumulating the quadratic norms of horizontal and vertical gradients of luminance values

of pixels of the image and choosing the pixels only on the images in the set which have

successfully passed the approximate definition test (see Zhang '494 fig 1 – 24 for

choosing a set of candidate enrollment images and Choi and Zhang '440 disclosing the

gradient measure of both single and two directions on image). See motivations provided

in claims 1 and 12 for combining Choi, Zhang '440 and Zhang '494.

With regards to claim 14, an extension to the arguments of claims 12 and 13, Zhang

'494 discloses selecting the clearest image from the set of images (see fig 1 – 33).

5.   Claims 16 and 17 – 20 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Choi in view of Zhang ('440) and Cheng (US pub no 2004/0179752).

With regards to claim 16, see the rationale and rejection for claim 1. In addition, Choi

and Zhang do not disclose comparing of the gradient to the maximum gradient

threshold. Cheng (US pub no2004/0179752) discloses comparing a gradient of the pixel

to a maximum gradient threshold and choosing the pixel for cumulating step at least

according to the comparing of the gradient to the maximum gradient threshold (see

paragraph 159, plurality of gradients are compared to a gradient threshold, if the gradients are less than this gradient threshold selected blue and green component pixels are selected). One skilled in the art would include step of comparing gradients to a maximum threshold because this threshold is use to determine the white areas of the eye, where the pixels there are all smooth with no edges, once the white areas is located then one will be able to locate the pupil and iris region.

With regards to claim 17, see the rationale and rejection for claim 2.

With regards to claim 18, see the rationale and rejection for claim 3.

With regards to claim 19, see the rationale and rejection for claim 3. In addition, see figure 1- 16, Mi is read as the maximum luminance threshold, of Zhang.

With regards to claim 20, see the rationale and rejection for claim 11.

6.   Claims 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Choi in view of Zhang ('440) and Cheng ('752) as applied to claim 16 further in view of Zhang ('494).

With regards to claim 21, see the rationale and rejection for claim 12.

With regards to claim 22, see the rationale and rejection for claim 13.

7.   Claims 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Choi in view of Zhang ('440) and Cheng ('752) as applied to claim 16 further in view of Suzaki (US pat no 6,307,954).

With regards to claim 23, Choi discloses all of the claim elements / features as discussed above in rejection for claim 1 and incorporated herein by reference, but fails to disclose eliminating from the eye image all pixels that are not within a predetermined vertical distance from the location of the pupil. Suzaki discloses the image is a sub-set of an eye image that is obtained by determining a location of a pupil of a pupil of the eye image and eliminating from the eye image all pixels that are not within a predetermined vertical distance from the location of the pupil (see figure 10, element 302, all the pixels above and below the rectangular window are not considered). One skill in the art would include eliminating pixels that are further away from the pupil section of the image because to reduce the amount of searching computation where searching a smaller image takes less processing time and power.

With regards to claim 24, an extension to the arguments of claim 23, Suzaki discloses eliminating some pixels from the eye image to create a reduced image (see figure 10, pixels outside of the window 302 are not consider), determining an average luminance of each of a plurality of blocks of the reduced image (see figure 4a and 4b), determining

which of the blocks has the lowest average luminance and determining a location of the

block with the lowest average luminance as the location of the pupil (see column 6 lines

36 – 38, when S(X,Y) is smallest, where S(X,Y) is the value of each block in figure 4b,

P(X,Y) will have the largest value, which indicates the location of the pupil). One skill in

the art would look for blocks which has the lowest luminance because when using the

gray scale on an image the darkest value starts from a value of zero and the brightest is

two hundred fifty five, if the image is using 8 bits, since the pupil section of the eye

image is one of the darkest area in the image, the system will process the eye images

at a faster rate knowing the location of dark areas in the image.

8.   Claims 25 – 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Choi in view of Zhang ('440) and Suzaki (US pat no 6,307,954).

With regards to claim 25, see the rationale and rejection for claim 1. In addition, Suzaki

discloses eliminating some pixels from the eye image to create a reduced image (see

fig 10 – pixels outside of the window 302 are not consider), determining an average

luminance of each of a plurality of blocks of the reduced image (see figure 4a and 4b),

determining which of the blocks has the lowest average luminance and determining a

location of the block with the lowest average luminance as the location of the pupil (see

col. 6 lines 36 – 38, when S(X,Y) is smallest, where S(X,Y) is the value of each block in

figure 4b, P(X,Y) will have the largest value, which indicates the location of the pupil).

One skill in the art would look for blocks which has the lowest luminance because when

using the gray scale on an image the darkest value starts from a value of zero and the

brightest is two hundred fifty five, if the image is using 8 bits, since the pupil section of

the eye image is one of the darkest area in the image, the system will process the eye

images at a faster rate knowing the location of dark areas in the image. Suzaki also

discloses the image is a sub-set of an eye image that is obtained by determining a

location of a pupil of a pupil of the eye image and eliminating from the eye image all

pixels that are not within a predetermined vertical distance from the location of the pupil

(see figure 10, element 302, all the pixels above and below the rectangular window are

not considered). One skill in the art would include eliminating pixels that are further

away from the pupil section of the image because to reduce the amount of searching

computation where searching a smaller image takes less processing time and power.

With regards to claim 26, see the rationale and rejection for claim 2.

With regards to claim 27, see the rationale and rejection for claim 3.

With regards to claim 28, see the rationale and rejection for claim 19.

9.   Claims 29 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Choi in view of Zhang ('440) and Suzaki ('954) as applied to claim 25 further in

view of Zhang ('494).

With regards to claim 29, see the rationale and rejection for claim 12.

With regards to claim 30, see the rationale and rejection for claim 13.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alex Liew whose telephone number is (571)272-8623. The examiner can normally be reached on 9:30AM - 7:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Bella can be reached on (571) 272-7778. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.
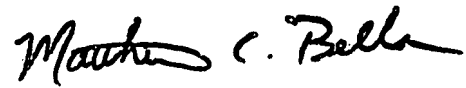
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Alex Liew

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